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making with each other angles of 120° (I think that these were not visible as distinct lines, but are to be taken as imaginary lines dividing the phenomena next to be mentioned), and in each of these angular spaces were coloured curves of hyperbolic character. Sir David Brewster then informed me that he became convinced that these appearances arose from some chronic derangement of the stomach, and that he adopted a cautious medical treatment, and that at length the luminous curves disappeared suddenly.

Sir David Brewster has subsequently published an account of this observation in a paper in the *Transactions of the Royal Society of Edinburgh*, vol. xxiv., part i., afterwards reprinted in the *Philosophical Magazine*, 1865, part i., page 426, and bearing the title "On the Cause and Cure of Cataract." The account of the phenomenon in this paper agrees generally with that which I had heard so long before, although, naturally, it is not so vivid as that which was given in conversation at a time so much nearer to the occurrence.

Some time,—perhaps two or three years,—after this conversation, I saw the appearance myself. It was on an occasion of sorrow, when my whole nervous system was for the time disturbed, and when the eye was moist. It is my impression that in each of the three compartments, I saw two irregular hyperbolas, one surrounding the other.

I have never seen the appearance again. I do not doubt that the appearances noted by Mr. Dawes are of the same ocular class, and that they present themselves only when the nervous system is in some measure deranged. It is scarcely necessary to remark that such derangement very usually accompanies an east wind. In a remarkable instance mentioned by Mr. Dawes, east wind and fatigue were combined.

Another circumstance noticed by Mr. Dawes, page 267, is that at high altitudes stars require a longer focus (that is, the eye requires more convergent rays) than at low altitudes. I imagine this also to be ocular. In looking at a low star, the eye can be directed almost exactly towards the star; but in looking at a high star, it is difficult to direct the eye to a sufficiently great elevation, and the pencil of light will fall low on the retina. It is possible, but I cannot say whether it is certain, that greater convergence of the incident pencil is then necessary for accurate concentration on the retina.

Royal Observatory, Greenwich,
May 20, 1867.

[illegible] p 233

Note on the alleged Change of Focus requisite in observing Stars widely separated in Altitude. By Captain Noble.

On the 10th of May, a discussion took place at the Meeting in reference to an alleged change in the focal length of a tele-

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scope adjusted on a star high up in the heavens, when it is turned upon one near the horizon. Since then I have been in communication with my friend Mr. Huggins upon this subject; and, at his instigation, have been experimenting upon stars which differ in colour, as well as in altitude. The night of Sunday last, the 9th inst., was so extraordinarily and exceptionally fine that I determined to devote it to these observations, and the results of them I now beg leave to lay before the Society.

I commenced with *Antares*, upon which I focussed with all possible accuracy. The companion was glaringly visible, and the definition of the primary more perfect than ever I saw it before. Having satisfied myself that the focus was exact, I turned the telescope upon *Vega, which was equally well defined*; no alteration whatever being requisite, nor indeed permissible, in the focus. I now reversed the operation, and, disarranging the eye-piece, refocussed upon *Vega*. Depressing the instrument once more until *Antares* came into the field again I found the same superb image which I had at first beheld and which the slightest motion of the eye-rack only deteriorated.

I then looked at Webb's red star in *Aquila*. It is a 7·5 mag. situated in R.A. $18^h\ 57^m\ 11^s$ and N.P.D. $95^\circ\ 53'$. The focus of this too corresponded with that of other white stars of about the same size. Finally I compared *α Herculis* (which I selected on account of its deep orange tint) with *λ Ophiuchi*; but, as before, the foci were one and the same. It will thus be seen that the results I obtained were wholly negative. Nothing could exceed the magnificence of the definition, *α Herculis* exhibited a single unbroken ring of light, like a golden hair, round the primary, the companion being free from any optical appendage whatever. The two stars might have been cut out of coloured tin and laid upon black velvet, from the appearance they presented.

The powers I employed were 255 and 394 upon my Ross Equatoreal of 4·2 inches aperture, and 61 inches focal length. I tried 154 upon *Antares*, but this was only to assure myself that I could see the *comes* steadily with that power.

If it be difficult to prove a negative, it is not much easier to infer anything from one; but it would seem to me that my observations tend to show that, in the very finest state of the atmosphere, the foci of all stars are identical: but that when, as in the normal state of things, there is an appreciable amount of vapour near the horizon a shortening of the focus of a telescope directed to objects in its neighbourhood may take place; a conclusion in accordance with the views which I orally expressed at our last Meeting.

Forest Lodge, Maresfield, Sussex,
June 14, 1867.

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